

We claim:

1. A kit for the detection and measurement of a transition element in a sample, where the measured transition element is a tag on a biologically active material that binds with at least one of an analyte and analyte complex, comprising:
 - (a) a tag comprising a transition element for directly tagging a biologically active material; and
 - (b) instructions for i) directly tagging a biologically active material; ii) combining the tagged biologically active material with at least one of an analyte and analyte complex under conditions in which the tagged biologically active material binds with at least one of the analyte and analyte complex, iii) separating bound tagged biologically active material from unbound material, and iv) detecting and measuring the bound tag elements using an atomic mass or optical spectrometer having a source of atoms or atomic ions.
2. The kit of claim 1 further comprising a biologically active material, wherein the biologically active material is directly tagged with a tag comprising a transition element.
3. A kit for the detection and measurement of a transition element in a sample, where the measured transition element is a tag on a competition analyte, comprising:
 - (a) a tag comprising a transition element for directly tagging a competition analyte; and

(c) instructions for i) directly tagging the competition analyte, (ii) combining the tagged competition analyte with at least one of the analyte and analyte complex, where the tagged competition analyte and at least one of the analyte and analyte complex are in competition for a binding site, iii) separating bound tagged competition analyte from the unbound tagged competition analyte, and iv) detecting and measuring the tag element on the bound competition analyte by an atomic mass or optical spectrometer having a source of atoms or atomic ions, wherein the detection and measurement of the tag element on the bound competition analyte is related to the detection and measurement of at least one of the analyte and analyte complex.

4. The kit of claim 3 further comprising a competition analyte, wherein the competition analyte is directly tagged with a tag comprising a transition element.

5. The kit of claim 1 or 2 further comprising capture molecules that bind the analyte, analyte complex or competition analyte.

6. The kit of claims 1 or 2 further comprising solid support means, wherein the solid support means comprises binding sites for one of the analyte and a capture molecule.

7. The kit of claims 6 wherein the solid support means is selected from the group consisting of microwell plates and beads.

8. The kit of claim 7 wherein the beads are selected from the group consisting of sepharose beads, agarose beads, polystyrene beads and polymeric microspheres.

9. The kit of claim 6 wherein the capture molecules are selected from the group consisting of antibodies and aptamers.
10. The kit of claims 1 or 2 further comprising standards.
11. The kit of claims 1 or 2 further comprising a dilution buffer.
12. The kit of claims 1 or 2 further comprising an elution buffer.
13. The kit of claims 1 or 2 further comprising a wash buffer.
14. The kit of claims 1 or 2 further comprising an assay buffer.
15. The kit of claims 1 or 2 wherein the source of atoms or atomic ions is selected from a group consisting of inductively coupled plasma, graphite furnace, microwave induced plasma, glow discharge, capacitively coupled plasma, electrospray, MALDI and corona.
16. The kit of claims 1 or 2 wherein the source of atoms or atomic ions is an inductively coupled plasma source.
17. The kit of claims 1 or 2 wherein the element is measured using an optical spectrometer.
18. The kit of claims 1 or 2 wherein the element is measured using a mass spectrometer.
19. The kit of claims 1 or 2 wherein the element is an isotope or ion.
20. The kit of claims 1 or 2 wherein the element is selected from a group consisting of the noble metals, lanthanides, rare earth elements, gold, silver, platinum, rhodium, iridium and palladium.

21. The kit of claim 3 wherein the biologically active material is selected from a group consisting of an antibody, Fab', aptamer, antigen, hormone, growth factor, receptor, protein and nucleic acid.
22. The kit of claims 1 or 2 wherein the element includes more than one element.
23. The kit of claims 1 or 2 wherein the element includes more than one isotope.
24. The kit of claims 1 or 2 wherein the element includes more than one atom of an isotope.
25. The kit of claim 23 wherein the element includes a different number of atoms of each isotope.
26. The kit of claim 1 comprising two or more elemental tags for simultaneous determination of two or more analytes.
27. The kit of claim 2 comprising two or more elemental tags for simultaneous determination of two or more analytes.
28. The kit of claims 1 or 2 wherein the analyte is a cytokine.
29. A kit for the detection and measurement of an element in a sample, where the measured element is a tag on an analyte in a sample, comprising:
- a) a tag comprising a transition element for directly tagging the analyte with a transition element;
 - b) reagents for tagging the analyte with the tag;
 - d) reagents for running a sample containing the tagged analyte on an electrophoreses gel; and

- d) instructions for i) tagging the analyte with a transition element, ii) running the sample containing the tagged analyte on an electrophoresis gel, and iii) detecting and measuring the element by an atomic mass or optical spectrometer having a source of atoms or atomic ions.

30. A kit for the detection and measurement of an element in a sample, where the measured element is a tag on a biologically active material that binds with at least one of an analyte and analyte complex, comprising:

- a) a biologically active material that binds with at least one of the analyte and analyte complex;
- b) a tag comprising a transition element; and
- c) instructions for i) combining the biologically active material with at least one of the analyte and analyte complex, wherein the biologically active material binds a transition element, ii) introducing the transition element to the sample, and iii) detecting and measuring the element using an atomic mass or optical spectrometer having a source of atoms or atomic ions.

31. A kit for the detection and measurement of an element of an elemental species in a sample where a biologically active material specific to an elemental species binds to the elemental species, comprising:

- a) a biologically active material specific to the elemental species; and
- b) instructions for i) introducing the biologically active material into the sample, ii) separating the biologically active material bound elemental species complexes from the sample, and iii) detecting and

measuring an element of the elemental species contained in the removed complexes using an atomic mass or optical spectrometer having a source of atoms or atomic ions.

32. The kit of claim 31 wherein the biologically active material is tagged with a transition element and the measured element is the element of the tagged antibody.

33. A method for the detection and measurement of a transition element in a sample, where the measured transition element is a tag on an aptamer that binds with an analyte, comprising:

- a) combining a tagged aptamer with the analyte, where the tagged aptamer binds with the analyte;
- b) separating bound tagged aptamer from unbound tagged aptamer; and
- c) detecting and measuring the transition element by an atomic mass or optical spectrometer having a source of ions or atomic ions.

34. A method for the detection and measurement of an element in a sample, where the measured element is a tag on an aptamer that binds with an analyte, comprising:

- a) combining the aptamer with the analyte;
- b) introducing a transition element to the combined aptamer and analyte, wherein the transition element binds with the aptamer; and
- c) detecting and measuring the transition element by an atomic or optical spectrometer having a source of ions or atomic ions.

35. A method for the detection and measurement of an element in a sample, where the measured element is a tag on a competition analyte, comprising:

- a) combining a tagged competition analyte with at least one of an analyte and analyte complex, where the tagged competition analyte and at least one of the analyte and analyte complex are in competition for a binding site;
- b) separating bound tagged competition analyte from the unbound tagged competition analyte; and
- c) detecting and measuring the transition element on the bound competition analyte by an atomic mass or optical spectrometer having a source of atoms or atomic ions, wherein the detection and measurement of the transition element is related to the detection and measurement of at least one of the analyte and analyte complex.

36. The method of claim 35 wherein the binding site is located on a capture molecule.